

PRELIMINARY DATA SUMMARY

August 1986

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility in Duck, North Carolina. The data were collected and the analyses performed by the FRF staff. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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I. INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Fig.1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The FRF consists of a 561-m (1,840 ft) long concrete research pier supported on 0.91 m (3 ft) diameter steel piles. The pier deck is 6.1 m (20 ft) wide, 7.74 m (25.4 ft) above mean sea level (MSL), and extends from behind the dunes to approximately the 7.6 m (25 ft) depth contour. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Most of the data are daily observations or the results of preliminary data analysis. In many instances, continuous analog records and more extensive analyses will be made available later by the CERC Coastal Engineering Information and Analysis Center (CEIAC).

Table 1 is a list of instruments used, their status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depth at the wave gages and current meters vary and may best be determined from the information contained in Figure 8. Other installation information is contained in Table 1. All times unless otherwise specified are referenced to Eastern Standard Time (EST).

Section II presents the meteorological data; Sections III through VI, oceanographic data; Section VII, nearshore profiles and bathymetry; and Section VIII, if included, documents special events that occurred at the FRF during the month.

Questions and/or comments concerning the data may be directed to Mr. Herman C. Miller at (919) 261-3511.

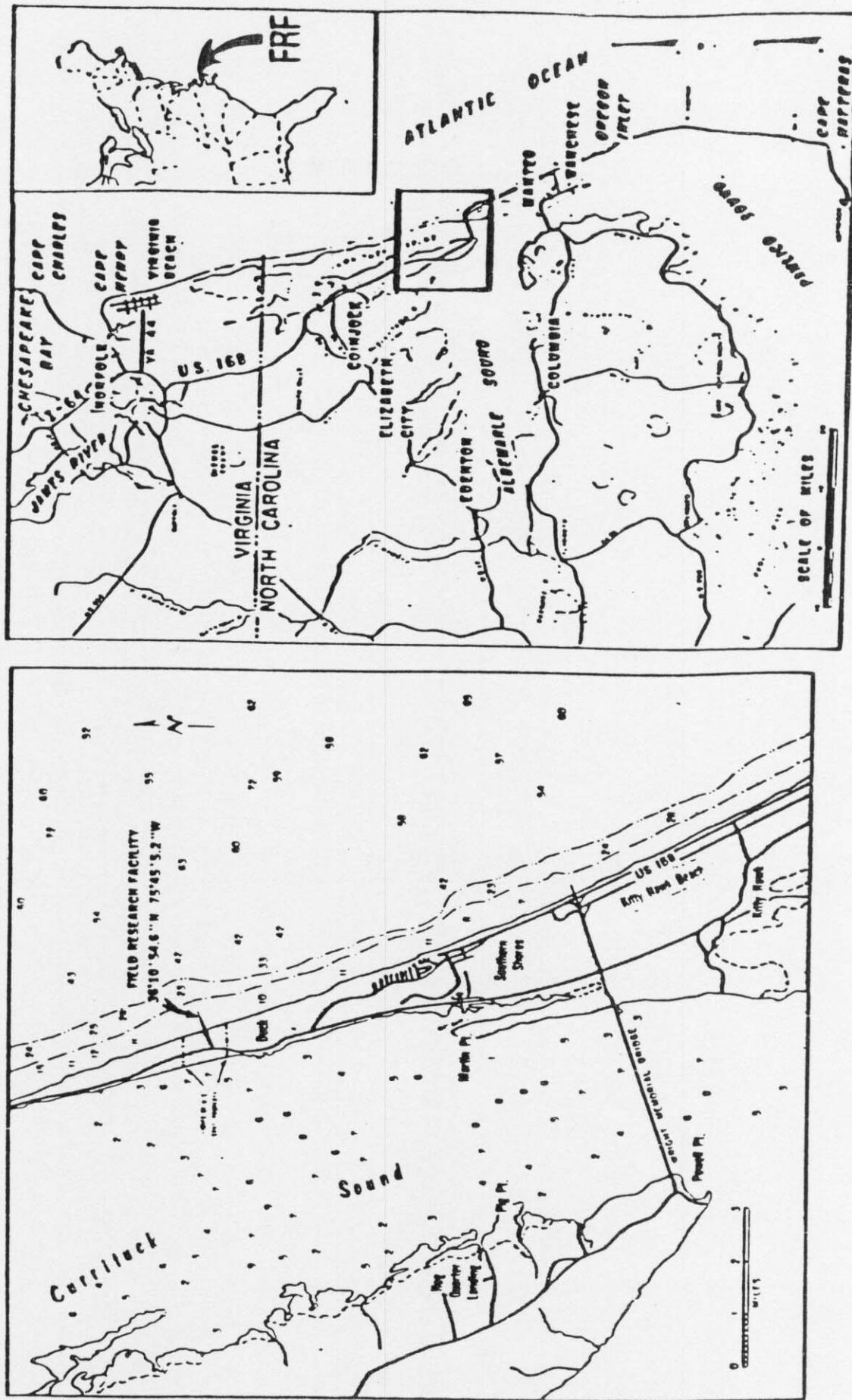


Figure 1. FRF Location Map

TABLE I
INSTRUMENT STATUS/DATA AVAILABILITY

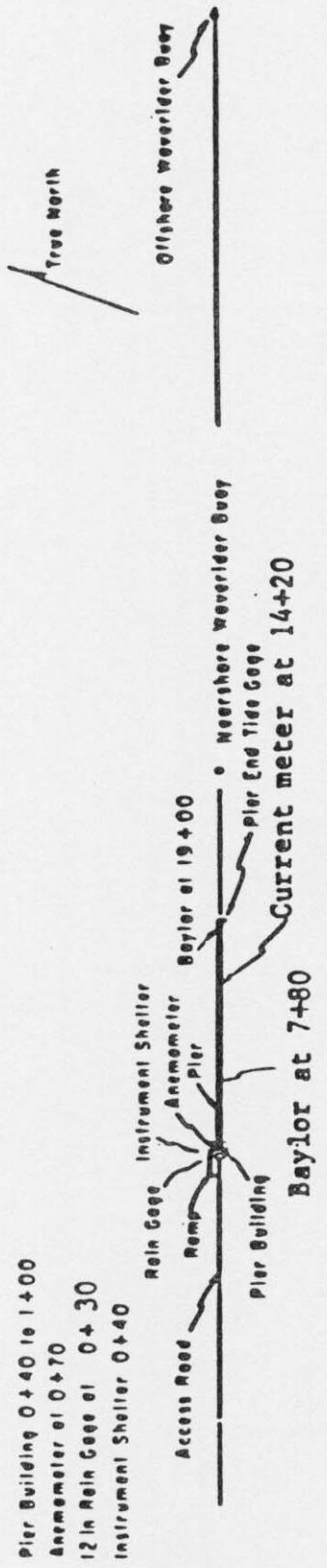
AUGUST 1986

GAGE NUMBER	DESCRIPTION/REMARKS	DEPTH AT SENSOR	DAY OF THE MONTH											
			1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31											
	Barometric Pressure		Instrument Status											
		Data Collected												
		Analog Record												
	Precipitation	Instrument Status												
		Data Collected												
		Analog Record												
	Air Temperature	Instrument Status												
		Data Collected												
		Maximum/Minimum												
	Anemometer on Lab Bldg - Elevation 19m (MSL)	Instrument Status												
		Data Collected												
		Analog Record												
645	Baylor staff located at station 7+80 on FRF Pier	See profile data	Instrument Status											
		Data Collected												
625	Baylor staff located at station 19+00 on FRF pier	See profile data	Instrument Status											
		Data Collected												
640	Waverider buoy located 1.0 km from shore	Approx. 8.5 m. MSL	Instrument Status											
		Data Collected												
630	Waverider buoy located 6.0km from shore	Approx. 18 m. MSL	Instrument Status											
		Data Collected												
639	Current Meter at station 14+20 on FRF pier	See profile data	Instrument Status											
		Data Collected												
679	Current meter 500m south (0.5km offshore)	Approx. 6 m MSL	Instrument Status											
		Data Collected												
865-1370	NOAA primary tide station located at seaward end of FRF pier.	Instrument Status												
		Data Collected												

Instrument Status: Operational - Daily Observation: YES

Data Collected: ALL , SOME

Analog Record: ALL , PARTIAL
Preliminary Analysis: ALL , SOME



CURRENT SOUND

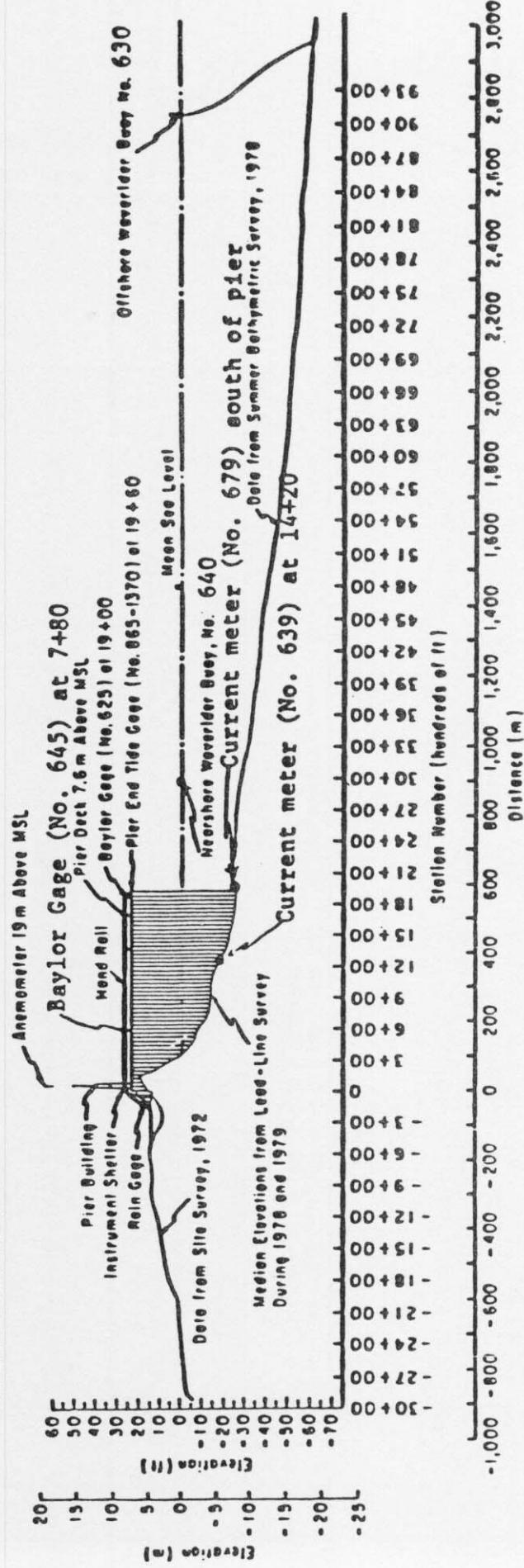


Figure 2. Instrument locations at FRF.

II. METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Fig. 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Data General NOVA-4 computer. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

The wind measurements are obtained from a Weather Measure Skyvane located on the FRF laboratory building (Fig. 2), 19.1 m above mean sea level (MSL).

The high and low temperatures are obtained from daily readings of NWS maximum and minimum thermometers and represent the extreme temperature values since the last reading.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in) -
 $mm \times .03937 = in$
2. Millibars (mb) to inches of mercury (in Hg) -
 $mb \times 0.02953 = in Hg$
3. Degrees Celcius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

TABLE 2: METEOROLOGICAL DATA

PART 1

AUGUST 1986

		WIND SPEED DAY HOUR (M/S)	WIND DIRECTION (DEG TN)	TEMPERATURE (DEG C)	ATM PRESSURE (MB)	PRECIPITATION (MM)
1	100	4	167	*	1013.4	0
	700	3	127	26.7	1013.8	0
	1300	6	125	*	1013.8	0
	1900	5	138	26.9	1013.1	0
2	100	4	198	26.8	1014.4	0
	700	5	197	28.1	1014.7	0
	1300	4	185	31.9	1015.0	0
	1900	7	194	25.3	1013.6	0
3	100	7	212	26.5	1014.2	0
	700	2	59	22.4	1015.5	0
	1300	4	196	25.7	1016.7	11
	1900	4	198	24.3	1017.1	0
4	100	3	217	24.6	1018.8	4
	700	2	23	22.5	1019.5	0
	1300	2	188	*	1020.5	0
	1900	4	149	23.1	1019.5	0
5	100	2	144	23.0	1020.3	0
	700	5	8	24.4	1020.1	0
	1300	5	76	27.8	1020.6	0
	1900	5	80	25.8	1019.6	0
6	100	1	123	24.8	1019.9	0
	700	3	53	26.2	1020.1	0
	1300	4	92	30.0	1020.3	0
	1900	4	155	26.5	1018.7	0
7	100	4	258	26.2	1019.0	0
	700	4	235	26.5	1018.8	0
	1300	5	127	31.2	1017.3	0
	1900	5	201	29.2	1015.2	0
8	100	7	237	27.3	1015.0	0
	700	6	228	26.7	1014.8	0
	1300	6	213	32.9	1012.7	0
	1900	2	63	25.0	1012.4	0
9	100	7	231	27.4	1014.1	0
	700	7	237	27.2	1015.2	0
	1300	5	242	31.2	1015.7	0
	1900	2	249	29.7	1014.9	0
10	100	6	227	27.5	1016.3	0
	700	5	237	27.5	1017.2	0
	1300	4	214	32.5	1017.7	0
	1900	8	224	28.2	1016.3	0
11	100	10	225	27.0	1016.4	0
	700	9	232	26.9	1016.9	0
	1300	5	224	32.0	1017.0	0
	1900	3	32	21.3	1017.3	0
12	100	5	236	24.0	1018.9	0
	700	2	64	21.2	1021.1	3
	1300	4	136	26.7	1021.2	0
	1900	5	114	21.2	1021.3	0
13	100	4	96	21.0	1020.6	14
	700	2	134	23.6	1020.6	13
	1300	6	49	23.5	1020.4	0
	1900	1	237	24.1	1019.4	0
14	100	2	86	23.6	1019.3	0
	700	1	6	24.7	1019.5	0
	1300	3	78	28.5	1019.1	0
	1900	0		25.9	1017.7	0
15	100	0		25.1	1017.7	0
	700	0		26.5	1017.6	0
	1300	5	78	28.4	1016.7	0
	1900	5	129	26.0	1015.2	0
16	100	2	206	25.3	1015.2	0
	700	4	125	26.4	1014.9	0
	1300	6	126	30.3	1013.9	0
	1900	4	102	26.6	1012.6	0

*=Gage inoperative

TABLE 2: METEOROLOGICAL DATA

PART 2

AUGUST 1986

DAY	HOUR	WIND SPEED (M/S)	WIND DIRECTION (DEG TN)	TEMPERATURE (DEG C)	ATM PRESSURE (MB)	PRECIPITATION (MM)
17	100	7	125	25.6	1011.7	4
	700	12	103	25.2	1010.1	4
	1300	22	98	23.7	1005.8	48
	1900	18	255	24.2	994.2	25
18	100	13	256	24.2	1004.2	0
	700	7	278	24.2	1009.7	0
	1300	3	46	27.7	1012.3	0
	1900	3	136	25.3	1013.7	0
19	100	2	168	23.8	1015.1	0
	700	5	66	23.2	1016.1	0
	1300	12	102	22.5	1015.9	13
	1900	8	77	22.5	1017.0	0
20	100	7	80	23.0	1016.9	3
	700	7	94	23.3	1017.6	0
	1300	10	126	24.2	1017.5	0
	1900	5	149	24.6	1016.9	0
21	100	4	171	24.8	1018.2	0
	700	3	239	25.0	1019.9	0
	1300	4	245	29.0	1019.5	0
	1900	3	206	27.4	1018.0	0
22	100				1017.8	14
	700	9	2		1021.6	9
	1300				1021.6	0
	1900	6	72		1021.9	0
23	100	4	56		1022.2	0
	700	3	77		1021.6	0
	1300	4	108		1019.9	0
	1900	5	164		1016.1	0
24	100	8	217		1014.1	0
	700	8	249		1013.1	0
	1300	11	5		1014.8	0
	1900	8	8		1015.5	0
25	100	3	302		1018.2	0
	700	8	227		1020.9	0
	1300	5	45		1021.6	0
	1900	5	140		1021.6	0
26	100	3	198		1022.2	0
	700	3	202		1022.9	0
	1300	3	211		1021.9	0
	1900	5	185		1019.5	0
27	100	7	214		1018.5	0
	700	6	228		1017.8	0
	1300	8	228		1014.1	0
	1900	7	207		1012.4	0
28	100	2	172		1012.8	5
	700	6	226		1012.1	39
	1300	11	340		1014.8	12
	1900	14	26		1018.8	0
29	100	13	29		1021.6	0
	700	12	41		1024.3	0
	1300	10	35		1026.6	0
	1900	9	48		1026.6	0
30	100	10	56		1027.0	0
	700	9	62		1027.7	0
	1300	9	57		1028.0	0
	1900	8	59		1026.6	0
31	100	9	60		1025.6	0
	700	11	63		1026.0	0
	1300	10	55		1025.6	0
	1900	9	64		1024.6	0

Gage Imperative

III. WAVE DATA

Wave data were collected from two Baylor staff gages (CERC gage Nos. 625 and 645) and Waverider buoys (CERC gage Nos. 630 and 640, Table 1 and Figure 2). The data were collected, analyzed, and stored on magnetic tape using a Data General NOVA-4 computer.

The NOVA-4 is programmed to sample the wave gages every 6 hours near 0100, 0700, 1300, and 1900 EST at a sampling rate of four times per second, collecting data in 20-minute records.

Wave height (H_{mo}) is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. The wave period is identified from the computation of a variance (energy) spectrum using a Fast Fourier Transform of 4096 data points (1024 sec). The period (T_p) is that associated with the maximum energy density in the spectrum. When this analysis is complete, the data are written to magnetic tape and entered into the CERC data base.

Table 3 presents the wave heights and periods for each wave record obtained during the month. The monthly means shown in Table 3 are an average of the values computed for all data records collected. The monthly standard deviations are standard deviations from the monthly mean of values for each record.

Figure 3 is a time history of the H_{mo} and T_p values for the Waveriders, 6 km from shore (630) and 1 km from shore (640).

Differences in wave periods between wave gages (Table 4 and Figure 3) may be due to wave breaking or reformation, or the presence of multiple wave trains containing nearly equal energy.

TABLE 3: WAVE DATA

PART 1

AUGUST 1986

GAGE		645		625		640		630	
DAY	TIME	Baylor at 7+80 Hmo(m)	T(sec)	Baylor at 19+00 Hmo(m)	T(sec)	Nearshr Wvrdr Hmo(m)	T(sec)	Farshir Wvrdr Hmo(m)	T(sec)
1	1	.49	6.40			.52	6.87	.55	7.42
	7	.47	6.87			.43	5.63	.51	6.87
	13	.58	6.40			.56	6.87	.70	6.87
	19	.56	8.06			.56	6.40	.66	6.87
2	1	.48	6.87			.49	6.87	.59	6.40
	7	.44	7.42			.43	6.87	.61	6.87
	13	.50	5.02			.53	6.87	.66	5.31
	19	.58	5.02			.64	5.99	.77	5.02
3	1	.61	5.02			.53	8.83	.69	5.99
	7	.58	5.99			.60	8.83	.64	8.83
	13	.50	5.63			.49	7.42	.57	5.02
	19	.46	6.87			.52	5.99	.60	6.40
4	1	.52	5.99			.42	7.42	.55	4.32
	7	.40	6.40			.42	6.40	.51	6.87
	13	.51	5.31			.45	5.99	.49	6.87
	19	.45	6.87			.48	5.63	.54	4.76
5	1	.49	5.99			.36	6.87	.45	6.40
	7	.41	6.40			.41	5.99	.45	6.87
	13	.58	5.63			.42	8.06	.48	8.06
	19	.49	3.79			.53	3.64	.56	3.79
6	1	.65	3.95			.48	3.79	.58	3.95
	7	.45	6.40			.54	6.40	.57	3.79
	13	.51	7.42			.42	7.42	.50	8.06
	19	.49	5.63			.52	7.42	.55	7.42
7	1	.51	5.99			.37	8.83	.49	8.83
	7	.36	8.06			.40	7.42	.46	8.06
	13	.44	8.06			.36	8.06	.45	8.83
	19	.48	8.06			.47	8.06	.55	8.83
8	1	.43	8.06			.40	8.83	.50	8.06
	7	.36	7.42			.38	8.83	.41	8.06
	13	.47	8.06			.34	8.06	.49	8.06
	19	.38	7.42			.38	8.06	.52	7.42
9	1	.28	6.40			.33	8.06	.44	5.99
	7	.39	5.99			.34	8.83	.50	6.87
	13	.28	5.63			.32	4.32	.50	5.31
	19	.38	7.42			.33	8.06	.39	4.53
10	1	.27	5.31			.29	8.06	.36	6.87
	7	.22	5.99			.27	8.06	.38	8.06
	13	.28	14.22			.27	8.06	.36	5.02
	19	.35	3.51			.41	3.38	.47	3.38
11	1	.30	8.06			.26	14.22	.52	2.24
	7	.30	5.31			.23	8.06	.44	2.35
	13	.32	12.34			.31	12.34	.43	4.32
	19	.72	3.15			.49	3.38	.56	12.34
12	1	.34	5.63			.33	12.34	.41	6.87
	7	.42	5.02			.34	12.34	.47	5.31
	13	.34	4.76			.36	4.53	.42	5.02
	19	.33	6.87			.30	12.34	.38	6.87
13	1	.34	7.42			.33	12.34	.48	3.64
	7	.59	3.95			.42	4.13	.47	4.53
	13	.57	5.31			.45	5.31	.50	7.42
	19	.77	5.63			.56	6.87	.69	6.40
14	1	.93	5.02			.89	5.02	.99	6.40
	7	1.00	5.02			.74	5.99	.83	6.40
	13	.69	5.63			.60	5.31	.83	6.40
	19	.65	5.31			.59	5.99	.78	5.63
15	1	.77	5.02			.68	5.63	.80	5.63
	7	.53	5.99			.56	5.31	.61	8.06
	13	.60	6.40			.60	5.02	.61	4.76
	19	.60	7.42			.62	6.40	.64	4.13
16	1	.59	6.87			.56	6.40	.65	6.40
	7	.53	6.40			.52	8.83	.55	8.06
	13	.54	8.83			.54	6.87	.60	8.06
	19	.76	8.83			.72	8.83	.76	8.83

Gage Inoperative

TABLE 3: WAVE DATA

PART 2

AUGUST 1986

GAGE		645		625		640		630	
DAY	TIME	Baylor at 7+80 Hmo(m)	T(sec)	Baylor at 19+00 Hmo(m)	T(sec)	Nearshtr Wvrd Hmo(m)	T(sec)	Farsht Wvrd Hmo(m)	T(sec)
17	1	1.06	5.99			.91	8.06	.99	6.87
	7	1.66	7.42			1.42	5.31	1.72	6.40
	13	1.64	6.87			2.76	8.83	3.02	8.06
	19	1.67	8.83			1.87	9.75	2.70	8.83
18	1	.82	8.06			.75	8.06	1.25	8.83
	7	.66	8.83			.74	6.87	1.03	8.06
	13	.72	7.42			.98	8.06	1.03	8.06
	19	.91	8.06			1.20	8.06	1.24	8.06
19	1	.60	5.99			.80	6.40	1.06	6.87
	7	.79	7.42			1.10	9.75	1.25	9.75
	13	.97	4.13			1.19	6.87	1.33	7.42
	19	.93	4.53			1.20	5.02	1.27	8.83
20	1	.80	9.75			1.21	8.06	1.27	9.75
	7	.80	5.63			1.13	7.42	1.26	7.42
	13	.89	3.79			1.33	8.83	1.31	3.95
	19	.72	5.02			1.07	8.06	1.34	5.31
21	1	.59	6.87			1.03	7.42	1.20	7.42
	7	.66	5.63			1.12	8.83	1.20	6.40
	13	.51	6.87			.87	6.87	1.02	8.06
	19	.55	10.89			.92	8.83	1.07	7.42
22	1	*				*		*	
	7	.82	4.13			1.27	10.89	1.33	10.89
	13	*				*		*	
	19	.90	12.34			1.55	14.22	1.52	12.34
23	1	1.17	12.34			1.70	14.22	1.44	14.22
	7	1.24	12.34			1.73	14.22	.61	14.22
	13	1.21	14.22			1.63	14.22	.52	16.79
	19	1.27	14.22			2.07	14.22	.68	12.34
24	1	.91	12.34			1.34	14.22	.53	12.34
	7	.74	12.34			1.43	10.89	*	
	13	.97	5.02			1.35	4.76	1.47	4.53
	19	.90	5.31			1.28	12.34	1.27	5.31
25	1	.55	12.34			.87	12.34	.85	12.34
	7	.66	3.95			.99	10.89	1.05	9.75
	13	.64	4.76			.88	9.75	.99	12.34
	19	.48	5.31			.76	12.34	.78	12.34
26	1	.36	12.34			.56	12.34	.66	12.34
	7	.36	8.83			.64	12.34	.73	10.89
	13	.31	12.34			.51	12.34	.56	9.75
	19	.47	3.95						
27	1								
	7								
	13	Electronic problems							
	19								
28	1								
	7								
	13	1.02	4.53			.39	12.34	.46	10.89
	19	1.55	6.40			1.20	4.76	1.63	5.02
29	1	1.39	5.63			1.71	5.63	2.18	6.40
	7	*				1.93	5.99	2.19	5.63
	13	*				*		*	
	19	.92	4.32			1.41	5.99	1.75	6.40
30	1	.83	4.32			1.35	6.40	1.51	6.40
	7	.80	4.53			1.19	5.31	1.30	4.53
	13	.93	5.02			1.08	4.13	1.22	4.53
	19	.80	5.63			1.16	5.31	1.40	4.76
31	1	.89	3.95			1.10	5.02	1.29	4.53
	7	.98	4.53			1.20	5.63	1.30	4.76
	13	1.15	7.42			1.37	5.63	1.53	5.99
	19	.95	7.42			1.48	6.40	1.58	6.40
						1.22	4.53	1.41	7.42
	MEAN	.66	6.85			.79	7.91	.87	7.24
	STD	.31	2.50			.48	2.78	.49	2.61

*=Electronic problems

CERC Gage Number 630, Waverider 6 km from shore

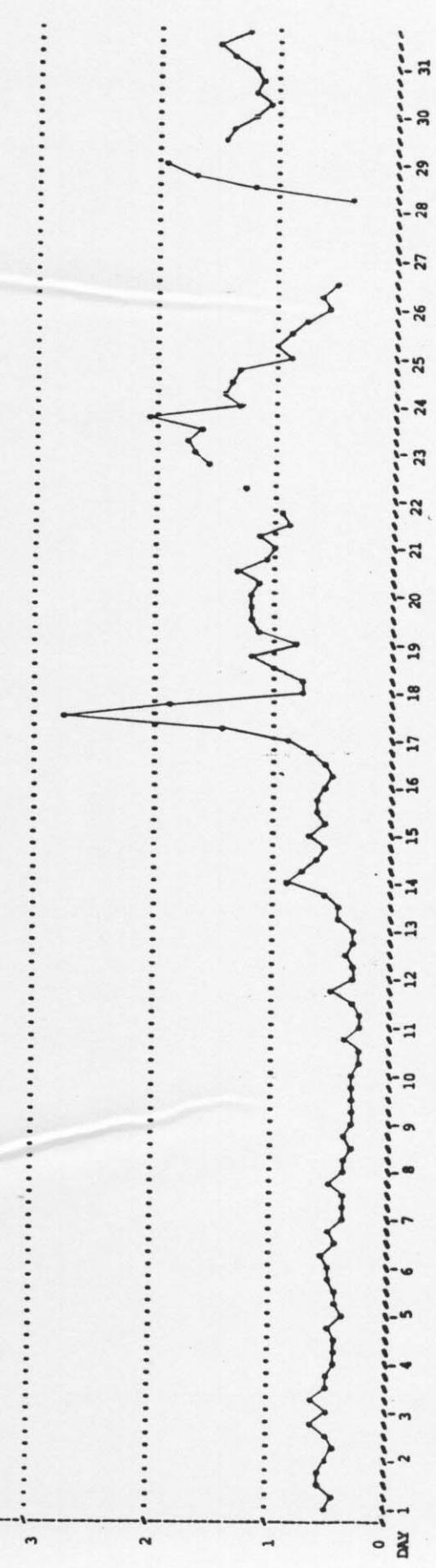
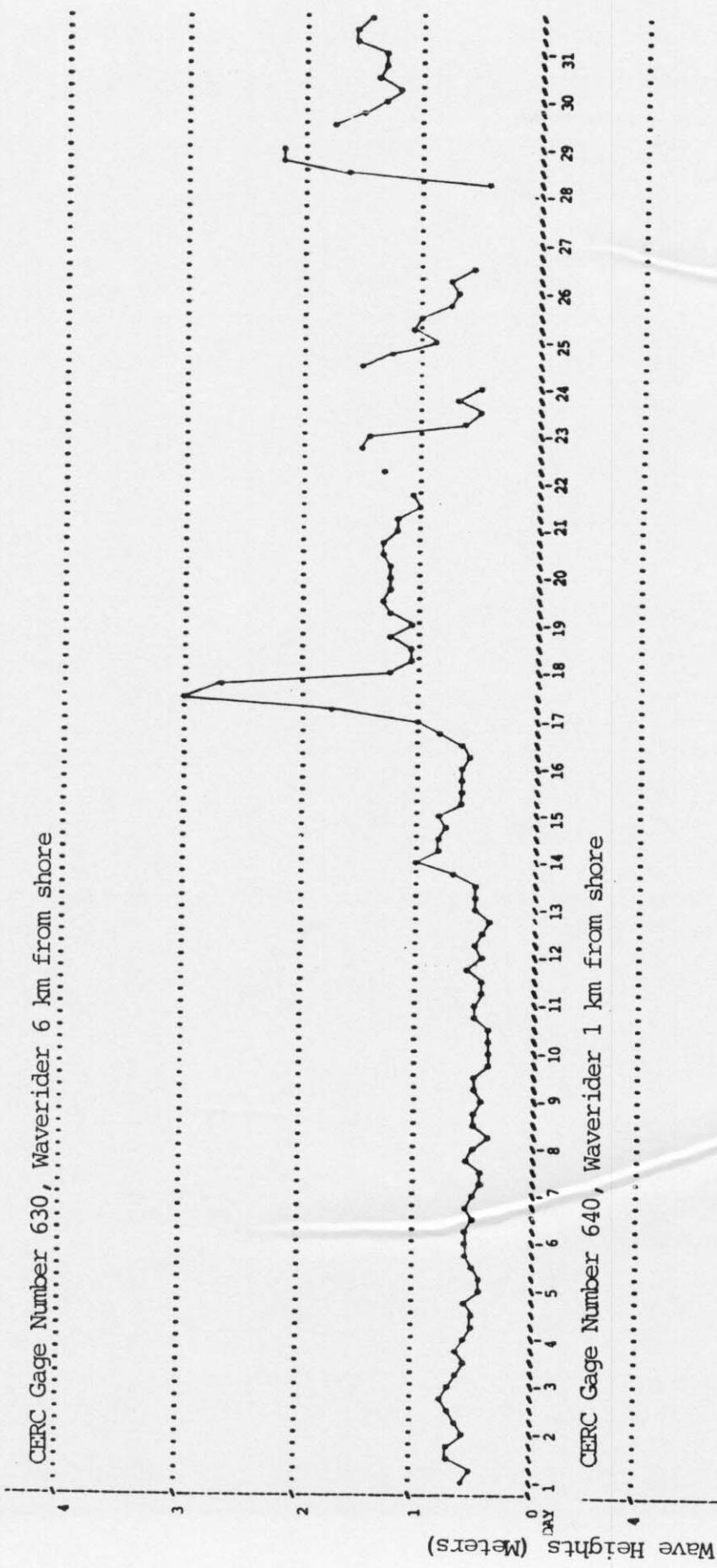
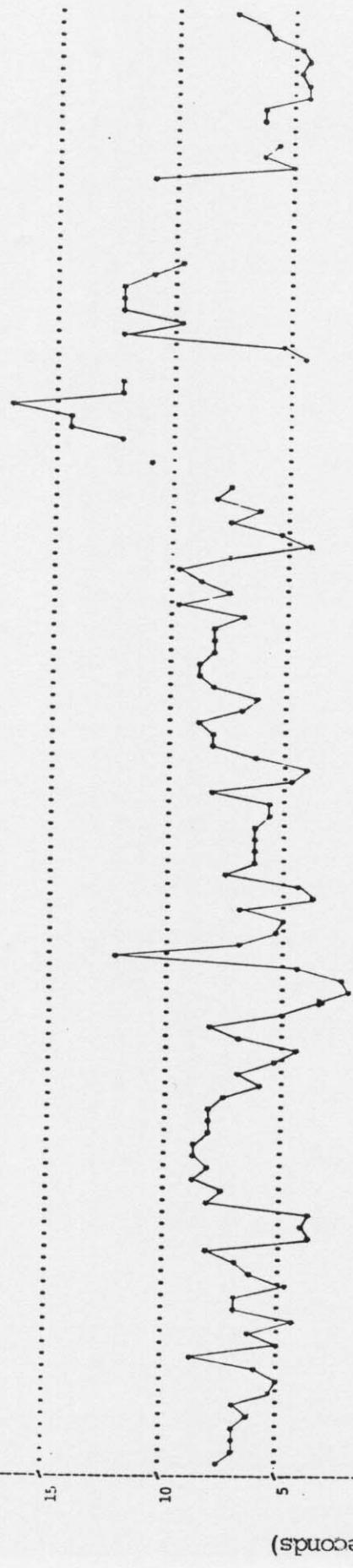


FIGURE 3. Time History of Wave Heights and Periods - August 1986

Part I: Heights

CERC Gage Number 630, Waverider 6 km from shore



CERC Gage Number 640, Waverider 1 km from shore

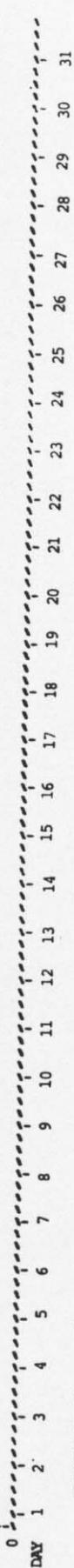
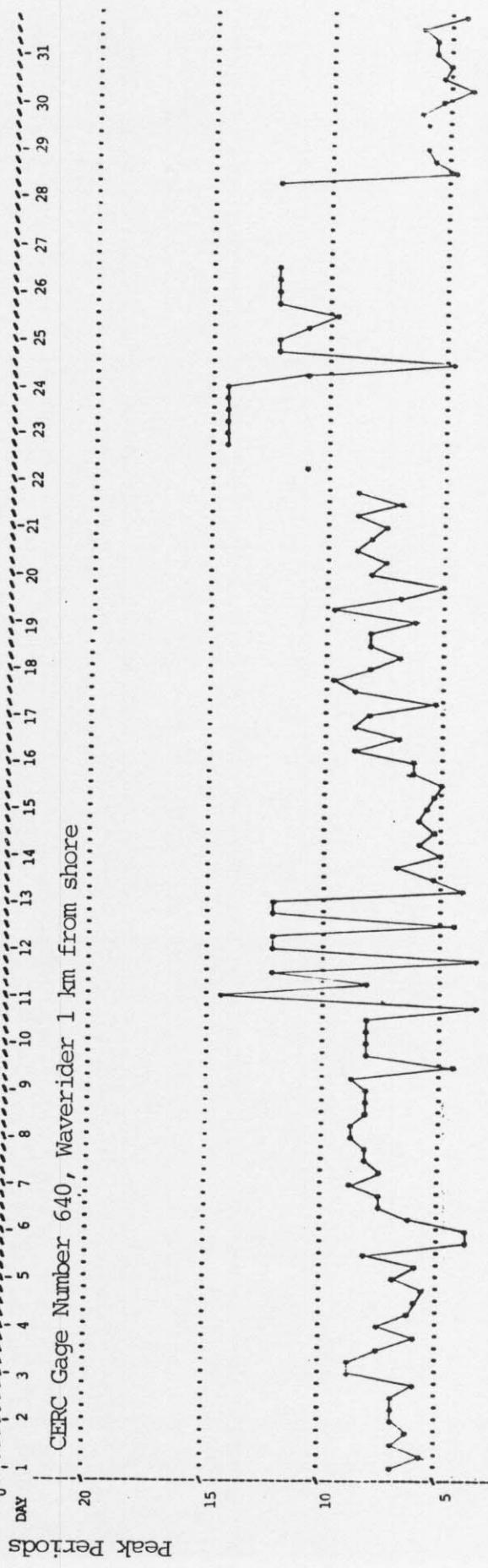


FIGURE 3. Time History of Wave Heights and Periods - August 1986

Part II: Periods

IV. CURRENT DATA

Current data (Table 4) are collected from two Marsh-McBirney electromagnetic biaxial current meters (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, alongshore currents flow either toward 340 (i.e. northward) or toward 160 (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second.

TABLE 4: CURRENT DATA
(SPEEDS IN CM/SEC)

August 1986

PIER MEASUREMENTS | BEACH MEASUREMENTS |

| (500 UPDRIFT) |

DAY	TIME	DYE AT	CURRENT METER	DYE AT MID-SURF ZONE	CURRENT METER
		19+00 (579m)	AT 14+20(433m) I.D. #639 (SURFACE)(DEPTH -4.2m MSL)	(SURFACE) DIST. FROM (SURFACE)	AT SOUTH TRIPOD 12M OFFSHORE (DEPTH -4.8m MSL) I.D. #679
1	0100-Alongshore				
	Cross-shore				
	Resultant				
1	0700-Alongshore	15 N			
	Cross-shore	1 On		140 23 N Off	
	Resultant	15 334		26 4	41 N
1	1300-Alongshore				
	Cross-shore				
	Resultant				
1	1900-Alongshore				
	Cross-shore				
	Resultant				
2	0100-Alongshore				
	Cross-shore				
	Resultant				
2	0700-Alongshore	28 N			
	Cross-shore	1 Off		140 34 N Off	
	Resultant	28 343		34 346	35 N
2	1300-Alongshore				
	Cross-shore				
	Resultant				
2	1900-Alongshore				
	Cross-shore				
	Resultant				
3	0100-Alongshore				
	Cross-shore				
	Resultant				
3	0700-Alongshore	8 S			
	Cross-shore	5 Off		140 68 N On	
	Resultant	9 129		20 326	33 N
3	1300-Alongshore				
	Cross-shore				
	Resultant				
3	1900-Alongshore				
	Cross-shore				
	Resultant				
4	0100-Alongshore				
	Cross-shore				
	Resultant				
4	0700-Alongshore	20 S			
	Cross-shore	7 On		140 7 N On	
	Resultant	21 182		7 316	34 N
4	1300-Alongshore				
	Cross-shore				
	Resultant				
4	1900-Alongshore				
	Cross-shore				
	Resultant				
5	0100-Alongshore				
	Cross-shore				
	Resultant				
5	0700-Alongshore	161 S			
	Cross-shore	9 On		128 87 N Off	
	Resultant	162 169		87 343	2 S
5	1300-Alongshore				
	Cross-shore				
	Resultant				
5	1900-Alongshore				
	Cross-shore				
	Resultant				
6	0100-Alongshore				
	Cross-shore				
	Resultant				
6	0700-Alongshore	10 S			
	Cross-shore	6 On		128 55 N On	
	Resultant	12 193		57 326	21 N
6	1300-Alongshore				
	Cross-shore				
	Resultant				
6	1900-Alongshore				
	Cross-shore				
	Resultant				

Gage Inoperative

KEY = ALL SPEEDS IN CM/SEC
N=NORTHWARD, SHORE PARALLEL
S=SOUTHWARD, SHORE PARALLEL
ON=ONSHORE
OF=OFFSHORE

DAY:	TIME	PIER MEASUREMENTS			BEACH MEASUREMENTS		
		DYE AT 19+00 (579m) (SURFACE)	CURRENT METER AT 14420(433m) I.D.#639 (DEPTH -4.2m MSL)	DYE AT MID-SURF ZONE (SURFACE)	DIST. FROM (SURFACE)	DYE 12M OFFSHORE (SURFACE)	CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL) I.D.#679
7	0100-Alongshore						
	Cross-shore						0
	Resultant						7
7	0700-Alongshore	0 0		34 N		2	160
	Cross-shore	2 On		10 Off		7	N
	Resultant	10 171		35 357		7	54
7	1300-Alongshore					6	S
	Cross-shore					1	ON
	Resultant					2	166
7	1900-Alongshore					3	N
	Cross-shore					4	OF
	Resultant					4	36
8	0100-Alongshore					0	
	Cross-shore					1	OF
	Resultant					1	70
B	0700-Alongshore	11 S		68 N		3	N
	Cross-shore	18 Off		128 3 Off		1	ON
	Resultant	21 101		68 343		3	311
B	1300-Alongshore					9	N
	Cross-shore					15	OF
	Resultant					17	38
B	1900-Alongshore					4	N
	Cross-shore					0	
	Resultant					4	340
9	0100-Alongshore					1	S
	Cross-shore					2	OF
	Resultant					2	90
9	0700-Alongshore	7 S		68 N		2	N
	Cross-shore	15 On		128 17 On		0	
	Resultant	16 223		70 326		2	340
9	1300-Alongshore					2	S
	Cross-shore					2	OF
	Resultant					3	120
9	1900-Alongshore					5	N
	Cross-shore					1	OF
	Resultant					5	348
10	0100-Alongshore					0	
	Cross-shore					2	OF
	Resultant					2	70
10	0700-Alongshore	7 N		13 N		3	N
	Cross-shore	16 Off		140 4 On		0	
	Resultant	17 45		14 323		3	340
10	1300-Alongshore					6	S
	Cross-shore					3	OF
	Resultant					7	132
10	1900-Alongshore					2	N
	Cross-shore					4	OF
	Resultant					4	49
11	0100-Alongshore					6	N
	Cross-shore					1	ON
	Resultant					6	322
11	0700-Alongshore	25 N		11 N		9	N
	Cross-shore	14 Off		152 3 Off		3	ON
	Resultant	29 9		12 354		9	320
11	1300-Alongshore					0	
	Cross-shore					1	OF
	Resultant					1	70
11	1900-Alongshore					1	N
	Cross-shore					4	OF
	Resultant					3	56
12	0100-Alongshore					0	
	Cross-shore					7	OF
	Resultant					7	70
12	0700-Alongshore	2 S		24 N		0	
	Cross-shore	1 Off		152 12 On		1	OF
	Resultant	2 125		27 313		1	70
12	1300-Alongshore					9	S
	Cross-shore					6	OF
	Resultant					11	125
12	1900-Alongshore					9	S
	Cross-shore					5	OF
	Resultant					10	128

Gage Inoperative

KEY = ALL SPEEDS IN CM/SEC
 N =NORTHWARD, SHORE PARALLEL
 S =SOUTHWARD, SHORE PARALLEL
 ON=ONSHORE
 OF=OFFSHORE

DAY:	TIME	PIER MEASUREMENTS			BEACH MEASUREMENTS			CURRENT METER (500' UPDRIFT)
		DYE AT 19400 (579m) (SURFACE)	CURRENT METER AT 14120(433m) I.D.#639 (DEPTH -4.2m MSL)	DYE AT KID-SURF ZONE (SURFACE)	DIST. FROM BASELINE(M)	DYE AT SOUTH TRIPOD 12M OFFSHORE (SURFACE)	(DEPTH -4.8m MSL)	
13	0100-Alongshore	SPEED	DIR	SPEED	DIR	BASELINE(M)	SPEED	DIR
	Cross-shore							S
	Resultant							5 OF
13	0700-Alongshore	47 S			68 N		17 S	12 138
	Cross-shore	0 0		152	14 Off	South	4	OF
	Resultant	47 157			69 351		17	146
13	1300-Alongshore						20	S
	Cross-shore						5	OF
	Resultant						21	142
13	1900-Alongshore						24	S
	Cross-shore						7	OF
	Resultant						24	144
14	0100-Alongshore						18	S
	Cross-shore						12	OF
	Resultant						21	126
14	0700-Alongshore	38 S			51 S		29	S
	Cross-shore	2 On		152	10 On	North	6	OF
	Resultant	38 163			52 171		29	149
14	1300-Alongshore						19	S
	Cross-shore						20	OF
	Resultant						29	138
14	1900-Alongshore						7	OF
	Cross-shore						30	147
15	0100-Alongshore						18	S
	Cross-shore						3	OF
	Resultant						17	152
15	0700-Alongshore	38 S			41 N		17	S
	Cross-shore	2 On		140	24 On	North	2	OF
	Resultant	38 163			47 309		17	153
15	1300-Alongshore						5	S
	Cross-shore						3	OF
	Resultant						6	132
15	1900-Alongshore						17	S
	Cross-shore						1	OF
	Resultant						12	156
16	0100-Alongshore						1	S
	Cross-shore						3	OF
	Resultant						4	89
16	0700-Alongshore	15 S			20 N		13	S
	Cross-shore	7 On		164	3 On	South	6	OF
	Resultant	12 187			21 331		15	135
16	1300-Alongshore						0	OF
	Cross-shore						5	20
	Resultant						12	S
16	1900-Alongshore						1	OF
	Cross-shore						12	153
	Resultant						10	S
17	0100-Alongshore						1	OF
	Cross-shore						10	157
	Resultant						1	S
17	0700-Alongshore	27 N			122 N		13	N
	Cross-shore	8 Off		152	49 Off	South	4	OF
	Resultant	28 357			131 2		14	S
17	1300-Alongshore						58	N
	Cross-shore						8	OF
	Resultant						52	348
17	1900-Alongshore						1	S
	Cross-shore						6	ON
	Resultant						6	245
18	0100-Alongshore						23	S
	Cross-shore						5	OF
	Resultant						24	142
18	0700-Alongshore	44 S			18 N		32	S
	Cross-shore	4 OFF		131	0 0	South	6	OF
	Resultant	44 154			18 343		33	150
18	1300-Alongshore						21	S
	Cross-shore						2	OF
	Resultant						23	136
18	1900-Alongshore						32	S
	Cross-shore						6	OF
	Resultant						32	142
	Gage	Inoperative						

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DAY	TIME	PIER MEASUREMENTS			BEACH MEASUREMENTS			CURRENT METER AT SOUTH TRIFOD (DEPTH -4.8m MSL)
		DYE AT	CURRENT METER	DYE AT MID-SURF ZONE	DYE	CURRENT METER		
		19+00 (579m)	AT 14+20(433m)	I.D.#639 (SURFACE) (DEPTH -4.2m MSL)	(SURFACE)	12M OFFSHORE DIST. FROM (SURFACE)	I.D.#679	
DAY	TIME	SPEED	DIR	SPEED	DIR	BASELINE(M)	SPEED	DIR
19	0100-Alongshore							
	Cross-shore						17	S
	Resultant						4	OF
19	0700-Alongshore		No observa-				20	S
	Cross-shore		tion				6	OF
	Resultant						21	143
19	1300-Alongshore						4	S
	Cross-shore						6	OF
	Resultant						8	106
19	1900-Alongshore						7	N
	Cross-shore						4	OF
	Resultant						8	12
20	0100-Alongshore						9	S
	Cross-shore						6	OF
	Resultant						11	126
20	0700-Alongshore	14	S			0	0	
	Cross-shore	15	Off			128	33	On
	Resultant	20	112			33	233	
20	1300-Alongshore							
	Cross-shore						1	S
	Resultant						7	OF
20	1900-Alongshore						10	N
	Cross-shore						8	OF
	Resultant						13	19
21	0100-Alongshore						14	S
	Cross-shore						2	OF
	Resultant						14	152
21	0700-Alongshore	10	0			38	S	
	Cross-shore	0	0			13	Off	
	Resultant	0	0			40	141	
21	1300-Alongshore							
	Cross-shore						8	S
	Resultant						8	OF
21	1900-Alongshore						11	N
	Cross-shore						3	ON
	Resultant						3	180
22	0100-Alongshore							
	Cross-shore							
	Resultant							
22	0700-Alongshore	76	S			29	S	
	Cross-shore	0	0			44	Off	
	Resultant	76	157			52	104	
22	1300-Alongshore							
	Cross-shore							
	Resultant							
22	1900-Alongshore							
	Cross-shore						15	S
	Resultant						4	OF
23	0100-Alongshore						16	147
	Cross-shore							
	Resultant							
23	0700-Alongshore	6	S			0	0	
	Cross-shore	1	Off			315	26	Off
	Resultant	6	146			26	104	
23	1300-Alongshore							
	Cross-shore							
	Resultant						10	S
23	1900-Alongshore						2	OF
	Cross-shore						13	115
23	Resultant						27	N
							1	ON
23	0100-Alongshore						27	338
	Cross-shore							
	Resultant							
24	0100-Alongshore							
	Cross-shore						10	N
	Resultant						5	ON
24	0700-Alongshore	30	N			12	N	
	Cross-shore	12	Off			201	22	Off
	Resultant	33	2			25	42	
24	1300-Alongshore							
	Cross-shore							
	Resultant						17	S
24	1900-Alongshore						4	OF
	Cross-shore						18	140
	Resultant						5	OF
							28	S
							25	149
							29	149
	Gage	Thopereative						

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 ON=ONSHORE
 OF=OFFSHORE

DAY	TIME	PIER MEASUREMENTS				BEACH MEASUREMENTS: (500 UPDRIFT)			
		DYE AT 19400 (579m)	CURRENT METER AT 14+20(433m)	DYE AT MID-SURF ZONE I.D.#639 (SURFACE) (DEPTH -4.2m MSL)	DIST. FROM BASELINE(M)	DYE 12M OFFSHORE (SURFACE)	CURRENT METER AT SOUTH TRIPOD (DEPTH -4.8m MSL)	I.D.#679	
25	0100-Alongshore Cross-shore Resultant								21 S
25	0700-Alongshore Cross-shore Resultant	34 S 5 On			29 S 164 22 On	39 S North			7 OF 22 142
25	1300-Alongshore Cross-shore Resultant	34 169			36 197				24 S 6 OF 16 S 11 OF
25	1900-Alongshore Cross-shore Resultant								20 125 4 N 2 OF
26	0100-Alongshore Cross-shore Resultant								4 6 7 N 2 OF
26	0700-Alongshore Cross-shore Resultant	17 N 4 Off			61 N 152 9 Off	23 N South			8 356 7 N 3 OF 8 7
26	1300-Alongshore Cross-shore Resultant	17 354			62 349				6 N 1 OF 6 347 8 N 2 OF 8 354
26	1900-Alongshore Cross-shore Resultant								11 N 1 OF 11 344
27	0100-Alongshore Cross-shore Resultant								11 344 13 N 3 ON
27	0700-Alongshore Cross-shore Resultant	21 N 8 Off			55 N 152 14 On	21 N South			13 326 10 N 3 ON
27	1300-Alongshore Cross-shore Resultant	23 2			57 326				11 325 9 N 0
27	1900-Alongshore Cross-shore Resultant								9 340 1 0
28	0100-Alongshore Cross-shore Resultant								2 340 1 N
28	0700-Alongshore Cross-shore Resultant	14 N 6 Off			18 N 152 0 0	25 N South			5 N 1 OF 5 352
28	1300-Alongshore Cross-shore Resultant	15 4			18 343				23 S 7 OF
28	1900-Alongshore Cross-shore Resultant								24 142 40 S 7 OF 22 150
29	0100-Alongshore Cross-shore Resultant								32 S 8 OF
29	0700-Alongshore Cross-shore Resultant	38 S 10 On			101 S 176 0 0	49 S North			33 147 29 S 8 OF
29	1300-Alongshore Cross-shore Resultant	39 174			101 157				30 145 20 S 7 OF
29	1900-Alongshore Cross-shore Resultant								22 141 22 S 6 OF
30	0100-Alongshore Cross-shore Resultant								23 143 15 S 6 OF
30	0700-Alongshore Cross-shore Resultant	19 S 6 On			55 N 152 28 On	30 S North			16 140 17 S 7 OF
30	1300-Alongshore Cross-shore Resultant	20 177			62 313				19 137 10 S 6 OF
30	1900-Alongshore Cross-shore Resultant								11 128 14 S 8 OF
31	0100-Alongshore Cross-shore Resultant								16 130 14 S 5 OF
31	0700-Alongshore Cross-shore Resultant	9 S 9 On			68 N 164 8 On	49 N South			15 139 18 S 8 OF
31	1300-Alongshore Cross-shore Resultant	13 205			68 334				20 137 2 S 1 ON
31	1900-Alongshore Cross-shore Resultant								3 183 11 S 10 OF 14 118

Gage Inoperative

KEY = ALL SPEEDS IN CM/SEC
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V. SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) taken at the seaward end of the pier are made of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves) but not surface chop or capillary waves. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring alignment of the wave crests. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 east of true north; consequently, wave angles greater than 70 imply the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are made daily at the seaward end of the FRF pier. A jar along with a thermometer is lowered about .3 m (1 ft) into the water and allowed to remain for at least one minute. The jar is removed, the temperature read and a hydrometer is used to determine the density. A secci disc is used to determine the surface visibility.

Table 5
SUPPLEMENTAL OBSERVATIONS

AUG 1986

DAY	TIME	WAVE APPROACH ANGLE:			WATER CHARACTERISTICS:			
		AT PIER END		RADAR WAVE:	AT PIER END		DENSITY:	SECCI:
		deg from True N	ANGLE deg:	WIDTH OF	SURF ZONE(m)	TEMP(C)	(g/cc)	VIS(m)
1	715	100			9	26.3	1.0198	5.5
2	637	100			15	24.6	1.0200	4.6
3	515	110			16	17.8	1.0242	4.6
4	705	105			12	18.8	1.0233	5.8
5	715	110			13	25.2	1.0195	6.1
6	710	70			13	26.0	1.0187	6.1
7	715	110			12	24.4	1.0200	6.1
8	720	125			15	17.4	1.0235	3.7
9	835	125			14	16.9	1.0243	5.5
10	730	135			9	18.0	1.0240	5.2
11	705	110			2	16.5	1.0246	5.5
12	715	125			14	17.0	1.0243	6.1
13	710	110			10	23.0	1.0205	6.1
14	730	60			20	24.7	1.0194	3.7
15	715	50			16	24.5	1.0200	4.6
16	815	120			15	25.5	1.0200	3.7
17	705	105		90	49	24.0	1.0206	4.0
18	720	125	20	inoperative	43	21.7	1.0219	0.9
19	no observations made							
20	705	90	45	60	58	24.5	1.0206	1.5
21	720	25	140		61	24.3	1.0207	1.8
22	524	30	50	50	111	25.0	1.0200	1.5
23	655	70			165	24.7	1.0200	1.2
24	650	75			238	24.5	1.0212	1.2
25	631	40		90	104	23.4	1.0216	0.6
26	507	90		80	70	23.7	1.0215	0.9
27	518	90		90	67	23.4	1.0219	0.9
28	603	90		90	46	22.4	1.0222	1.5
29	615	45		50	151	21.3	1.0226	0.6
30	644	60	80	90	96	20.8	1.0220	0.6
31	810	75	55	80	168	21.8	1.0212	0.9

VI. WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours), and contains a list of selected mean and extreme values. This presentation is useful in identifying effects on both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

FRF TIDE HEIGHTS

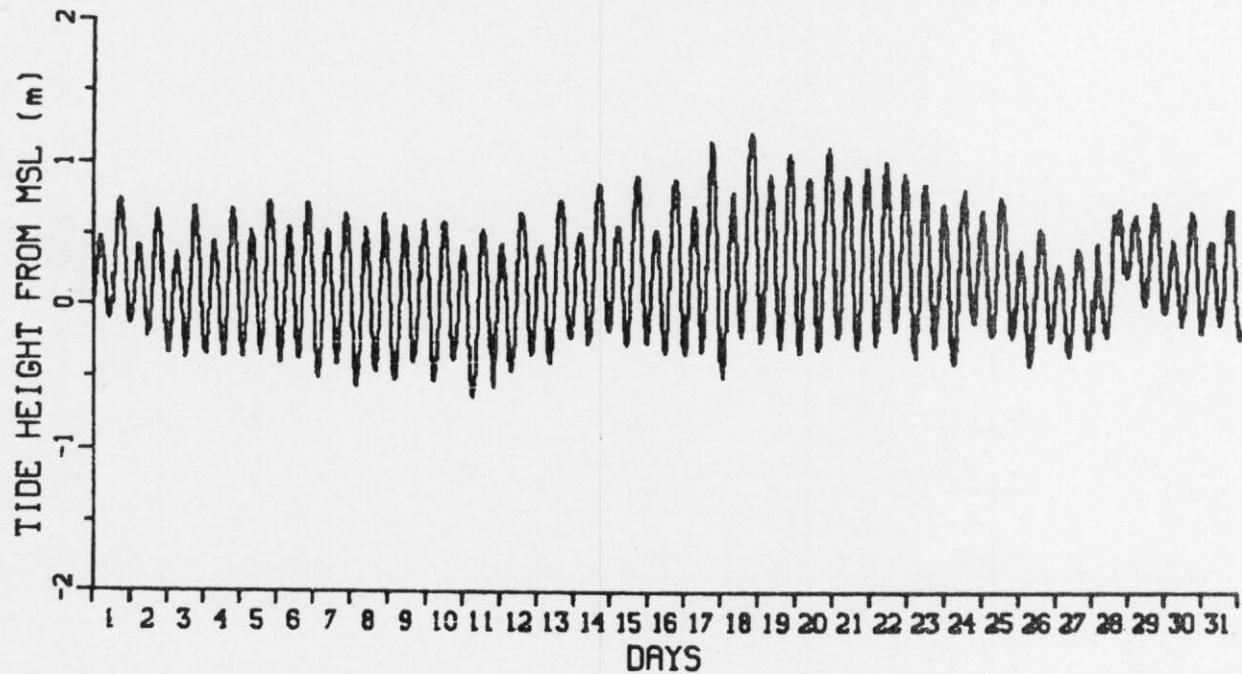


FIGURE 5. Time History of Mean Water Levels, August 1986 (Gage No. 865-1370)

MONTHLY MEAN WATER LEVELS (METERS MSL)

Extreme Low -	-0.63 on 11 August at 0500 hrs.
Extreme High -	1.20 on 18 August at 1800 hrs.
Monthly Mean -	0.19
Mean Low Water -	-0.31
Mean High Water -	0.68
Mean Range -	0.98

TABLE 6
WATER LEVELS (METERS MSL)
Tidal Characteristics

August 1986

MID-CYCLE DAY	TIME	LOW	HIGH	MEAN	RANGE
1	1843	-0.13	0.75	0.33	0.88
2	709	-0.22	0.42	0.12	0.64
2	1934	-0.33	0.66	0.18	0.99
3	759	-0.37	0.38	0.02	0.75
3	2024	-0.34	0.69	0.16	1.03
4	849	-0.36	0.46	0.06	0.81
4	2115	-0.35	0.68	0.17	1.03
5	2205	-0.40	0.73	0.19	1.14
6	1030	-0.37	0.55	0.09	0.92
6	2255	-0.50	0.72	0.12	1.23
7	1121	-0.41	0.53	0.06	0.94
7	2346	-0.55	0.64	0.06	1.19
8	1211	-0.45	0.54	0.04	0.99
9	36	-0.52	0.64	0.04	1.15
9	1301	-0.39	0.56	0.08	0.95
10	127	-0.52	0.60	0.03	1.12
10	1352	-0.37	0.59	0.09	0.97
11	217	-0.63	0.42	-0.10	1.05
11	1442	-0.56	0.53	0.05	1.09
12	307	-0.45	0.43	-0.01	0.89
12	1533	-0.34	0.65	0.17	0.98
13	358	-0.40	0.42	0.04	0.81
13	1623	-0.22	0.73	0.25	0.95
14	448	-0.27	0.51	0.15	0.77
14	1713	-0.18	0.85	0.34	1.03
15	538	-0.27	0.55	0.16	0.83
15	1804	-0.27	0.91	0.33	1.18
16	629	-0.34	0.52	0.12	0.86
16	1854	-0.34	0.88	0.30	1.22
17	719	-0.32	0.69	0.22	1.01
17	1944	-0.49	1.15	0.31	1.64
18	810	-0.22	0.79	0.24	1.01
18	2035	-0.25	1.20	0.51	1.45
19	900	-0.29	0.91	0.32	1.20
19	2125	-0.33	1.05	0.38	1.38
20	950	-0.31	0.89	0.30	1.20
20	2216	-0.23	1.10	0.42	1.32
21	1041	-0.30	0.91	0.31	1.21
21	2306	-0.28	0.96	0.34	1.23
22	1131	-0.18	1.00	0.41	1.18
22	2356	-0.36	0.92	0.31	1.28
23	1222	-0.29	0.85	0.30	1.14
24	47	-0.40	0.71	0.14	1.11
24	1312	-0.12	0.81	0.31	0.93
25	137	-0.21	0.66	0.21	0.88
25	1402	-0.22	0.76	0.27	0.98
26	228	-0.41	0.39	0.01	0.80
26	1453	-0.24	0.54	0.15	0.78
27	318	-0.34	0.29	-0.02	0.63
27	1543	-0.28	0.41	0.07	0.70
28	408	-0.21	0.44	0.03	0.65
28	1634	0.09	0.69	0.43	0.59
29	459	0.02	0.65	0.35	0.63
29	1724	-0.04	0.73	0.35	0.77
30	549	-0.13	0.48	0.17	0.60
30	1814	-0.18	0.66	0.26	0.84
31	640	-0.12	0.47	0.16	0.59

VII. NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in July and the two surveys in August on profile line 188, located 517 m south of the pier. The significant changes to the profile resulted from the passage of Hurricane Charley on 17 August. Up to 0.3 m of sediment, which had accreted prior to the storm, was removed from the foreshore (80 to 140 m) resulting in the creation of a small nearshore bar (160 m). In addition, an 80 m portion of the storm bar (240 to 320 m) was removed.

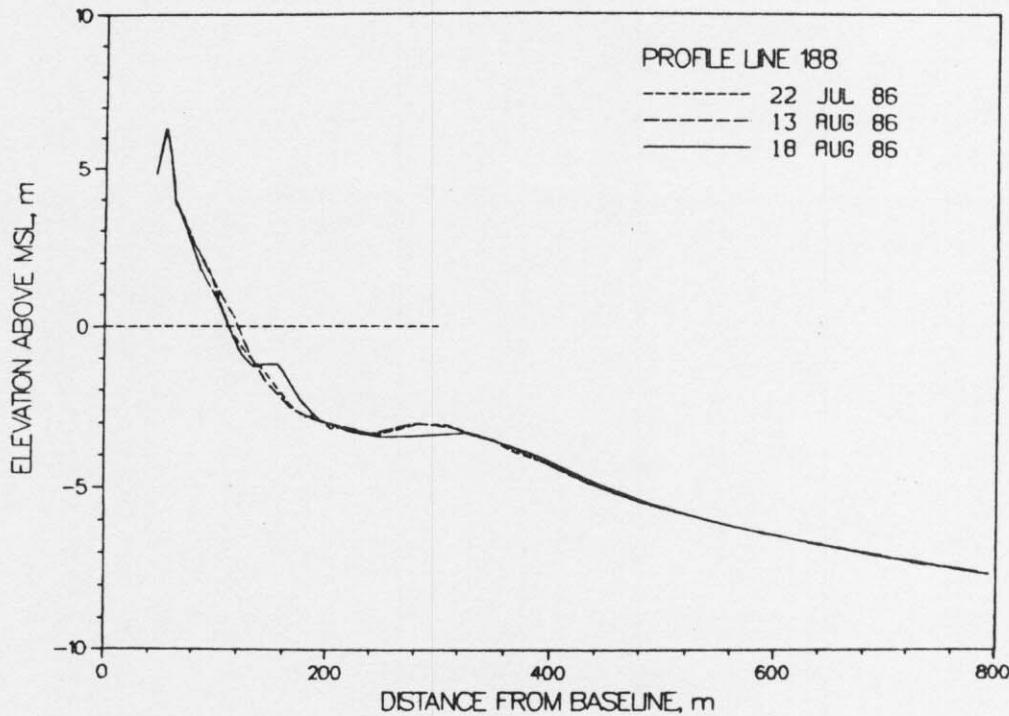


Figure 5. Monthly CRAB profiles on profile 188 - 517 meters south of pier.

The profile envelope (Figure 6) reflects the maximum changes which occurred on the profile between January and August. The only change to the envelope (100 to 120 m) resulted from the accretion on the foreshore prior to the hurricane.

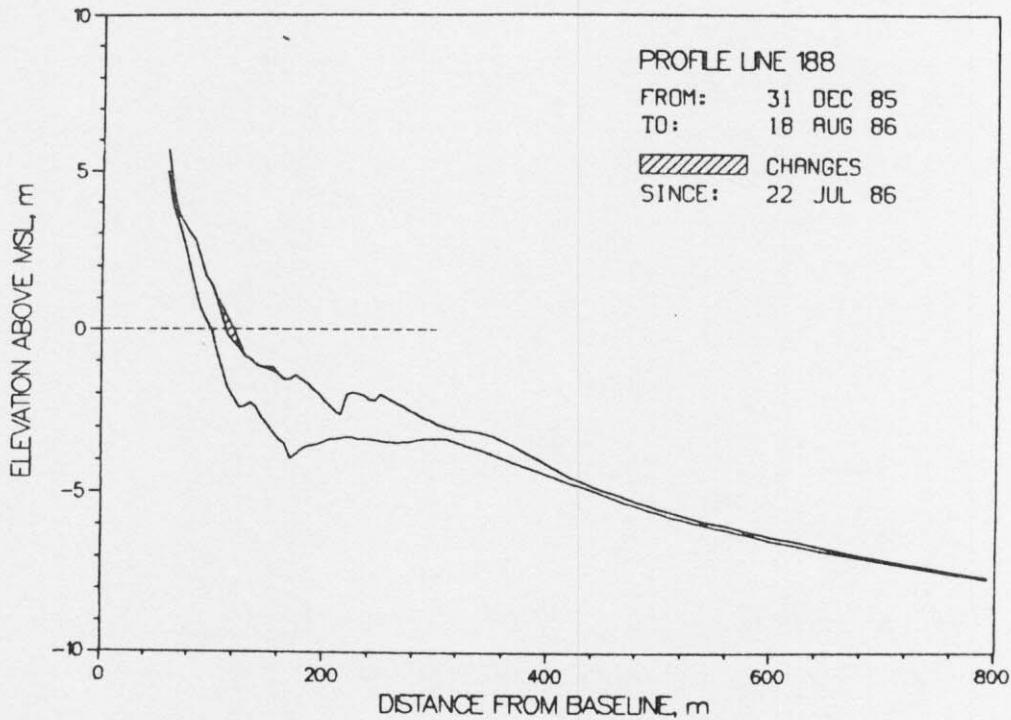


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. No bathymetric survey was conducted in August. The July bathymetric survey is given for reference.

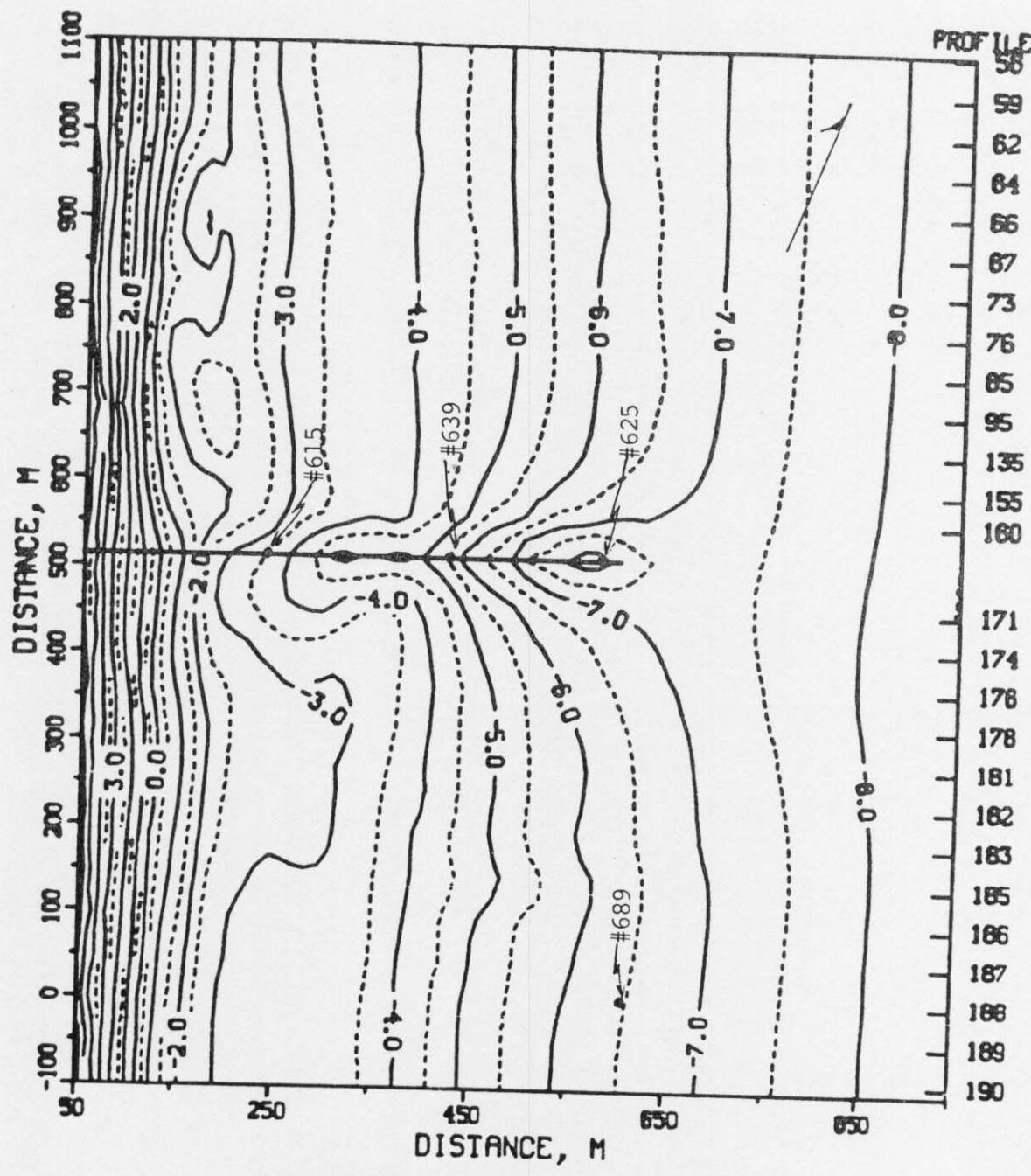


Figure 7. FRF BATHYMETRY 23 JUL 86
CONTOURS IN METERS

VIII. SPECIAL EVENTS

A. Storm Data Collection. The following list identifies times when the wave height at the seaward end of the pier (i.e. as measured by the Baylor gage #625 at pier station 19+00) exceeded 2 m and wave records were obtained every hour:

<u>Start</u>	<u>End</u>
17 Aug (1000)	17 Aug (1800)

B. Storm Synopsis.

Hurricane Charley-17 August 1986 - A tropical depression located in the Gulf of Mexico on 12 August slowly tracked across southeastern U.S. and became stationary off the South Carolina coast early on 15 August. Slowing gaining strength, the low became Tropical Storm Charley early on 16 August with the eye remaining stationary off South Carolina. Reaching minimal hurricane strength early on 17 August, Hurricane Charley slowly turned north gaining speed but not intensity as the day progressed. Charley's eye passed over the FRF between 1530 and 1700 that afternoon. Wave heights near the end of the pier (gage #640) remained above 2 m for only 8 hours, the heights dropping dramatically following the passage of the eye and the switching of the wind direction. Sustained easterly winds exceeded 24 m/s with the highest gust reaching 33 m/s at about 1500 hours. The maximum gust following the eye's passage was 24 m/s from the WSW. The maximum Hmo (gage #640, 1 km offshore) of 3.41 m (9.75 period) was recorded at 1600 hours. At gage #630 (6 km offshore), the maximum Hmo was 3.96 m. The lowest barometric pressure reading was 988.5 mb at 1530 hours. Total precipitation was 81 mm.

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